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MEDICAL DEVICES AND ITS COATING METHOD

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ABSTRACT

The present research relates to upgrading the coating and also its methods for the medical devices such as stents, embolic coils, grafts where the coating composition comprises a biocompatible carrier or polymer (e.g., at least one lipid) and at least one therapeutic or pharmaceutically active agent to enhance the properties of the devices when in contact with the body. The medical device with the coating on the surface was designed to improve the haemocompatibility of the implant by reducing the risk of surface activation.

KEYWORDS: Coating, Biocompatible Polymer & Medical Devices

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Original Article

INTRODUCTION

The implantable medical devices are used in a wide range of applications including bone replacement and materials, vascular graft, shunts and stents for the peripheral and neurovascular application and implant designed only for prolonged release of the drugs. The device may be made of metals, alloy, polymers or ceramics and other biocompatible material. It is important that the surfaces which contact to the lumen of the body tissue and fluids. The cells provide biocompatibility and non toxicity. The device is intended for the contact with the blood and it does not include thrombosis. The coating of the device with attached via most of the coating solution which may leads to improvement in the coagulation of the blood vessels to reciprocate the outer diameter. The medical devices should be free to measure the excellent administration for the development of the process of the coating solution. Medical devices are widely used in the modern health care industry. It is developed for implantation or inserting into the human body, and needs to be biocompatible. Some of the devices are often composed in part of metallic alloys, but need to be coated with a biocompatible or haemocompatible coating with the polymer based material which prevents the formation of clots, improves wettability, and promotes endothelialization. The existing research relates to upgrading the coating and also coating methods for the medical devices such as stents, embolic coils, grafts where the coating comprises a biocompatible carrier or polymer at least one lipid, which act as therapeutic or pharmaceutically active agent, it enhance the properties of the devices when in contact with the body. The medical device with the coating on the surface was designed to improve the biocompatibility of the implant by reducing the risk of surface activation. The research provides the medical devices with improved biocompatible polymeric coatings. The provided medical device having a surface which in use contacts to the lumen of the body tissue, wherein said surface has on it a biocompatible coating layer comprising a polymer having negatively charged phosphate bonded to a small, positively charged choline group. The medical devices having metal for at least a portion of which is coated with a metal oxide nanolayer. A portion of the metal oxide nanolayer is coated with positively charged choline groups which is substituted with at least one reactive organic substituent. The polymer is bonded to reactive organic substituents of

the hydrophilic polar head group. The research is directed to methods of coating the coated medical devices. This concerns coating solutions and methods of coating with such solutions or polymer and coatings formed from the solutions, and medical devices. The research is useful for the devices in contact with neurovascular system and which require a biocompatible surface. The preparation of phosphoryl choline coating solution which is coated on the stents contain polymer having ethanol, methanol, isopropyl, alcohol etc. The coating solution having ethanol act as vehicle and it was added and mixed to give a clear solution.

MATERIAL AND METHODS

The research relates to coating for implantable medical devices. The present research provides biocompatible coatings which are capable for uniformly coating surface of a medical device. The device also provide polymer (e.g. at least one lipid) and one therapeutic or pharmaceutically active agent on the surface of the implant. The coating is useful for the devices in contact with the circulatory, peripheral, respiratory or neurovascular system which require a biocompatible surface. The research can include but not limited to stents, such as intracranial stents, carotid stents, cardiac stents, and peripheral vascular stents. The polymer having positively charged choline group which is substituted with at least one reactive organic substituent. The medical devices are often composed in whole or part of metallic alloy. It may need to be coated with a biocomapatible or haemocompatible coating with the polymer based material. The provided medical device having a surface which is in contact with the lumen of the body tissue, wherein said surface has on it a biocompatible coating comprising a polymer having negatively charged phosphate bonded to a small positively charged choline group. The research mainly concern about the implanted into the human body. The surface of the medical device has a biocompatible coating layer comprising a bioresorbable carrier/polymer having the hydrophilic polar head group of phospholipids which is composed of a negatively charged phosphate bonded to a small, positively charged choline group. The preparation of phosphoryl choline solution which is coated on the stents containing polymer choline coating solution which having ethanol, methanol, isopropyl alcohol, etc act as vehicle. The procedure for dissolving polymer in particular solvent shown in fig. 01A-01D. The dissolving polymer contains the closable vessel containing the polymer having a weight of 0.1, 0.2 and 0.3 gm shown in fig. 01A-01D. The polymer may dissolve in the specific vehicle i.e., ethanol of 10, 20 and 30 ml respectively. The solution can be stir until to give a clear solution and may stand to dissolve at the room temperature. It might be take time about 14 to 20 hr for the dissolving the polymer in the ethanol.

Sr. No.	Composition
01.	Polymer (Phosphoryl Choline)
02.	Ethanol
03.	Active Pharmaceutical Ingredient

As shown in Figure 02A- Figure 02B, method of dip coating according substrate dimension. The coating solution was weighed and then dipped into the clear polymeric solution in a closable vessel. The vessel was evacuated until a pressure creates into the vessel. The vacuum was released and the stent was placed into the coating solution for several minutes. Then stent or medical device was dried under a room temperature for 12 to 20 hours. The amount of coating solution was calculated by the weighing measurement. Another technique of the drying of present research wherein, the coated stent should be kept into the hot air oven at 25 ^{o}C, 50 ^{o}C and 75 ^{o}C for ½ hour, 1 hour and 2 hours.

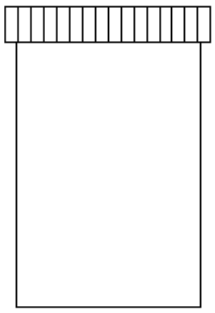

Figure 01A

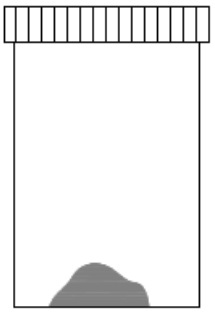

Figure 01B

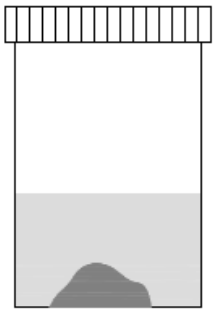

Figure 01C

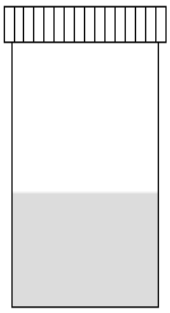

Figure 01D

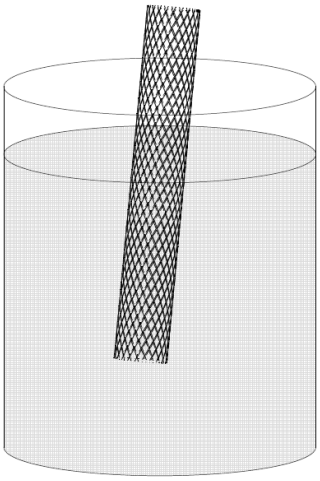

Figure 02A

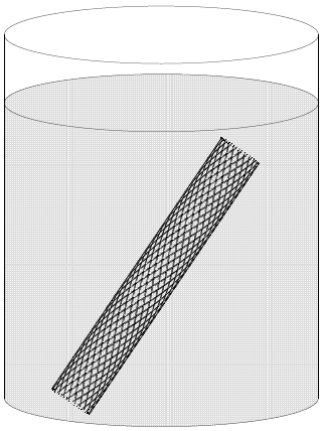

Figure 02B

RESULT AND DISCUSSION

The metallic surfaces of medical device can help to prevent the formulation of dots, improve wettability, and reduce the friction between the lumen of the body tissue which is associated with insertion while deployment. (e.g., at least one lipid) and at least one therapeutic or pharmaceutically active agent on the surface of the implant, such as promoting the endothelialization of an implantable medical device in blood contacting environment. The medical devices are often composed in whole or in part of metallic alloy, which have the advantages of mechanical durability and stability in the lumen of the artery, but may need to be coated with a biocompatible or haemocompatible coating with the polymer based material which prevent the formation of clots, improve wettability, promote endothelialization etc. The coating of the medical device having at least one metal for at least a portion of which is coated with the metal oxide nanolayer. The biocompatible coatings which are capable for uniformly coating surface of a medical device.

CONCLUSIONS

Coating medical devices with biocompatible polymers to mash the underlying thrombotic surface is an effective approach to improve the biocompatibility of medical materials. The crosslinkable coatings have additional advantages over other non-crosslinkable coating in terms of stability of the film and the possibility of anchoring the polymer to the substrate. Controlled permeation and releasing of drugs from polymeric coated implant will concentrate the drug at the precise site where it is needed. Blood contact device contain Phosphorylcholine crosslinkable coating. It provides a new approach to treat device based infection, tumor and stent restenosis etc.

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